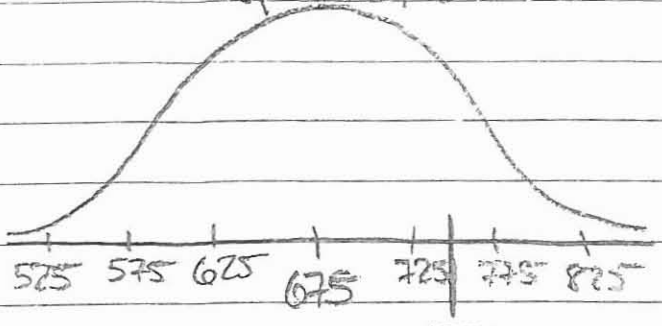
Normal Model Worksheet

① Standard bulb

$\mu = 675, \sigma = 50$

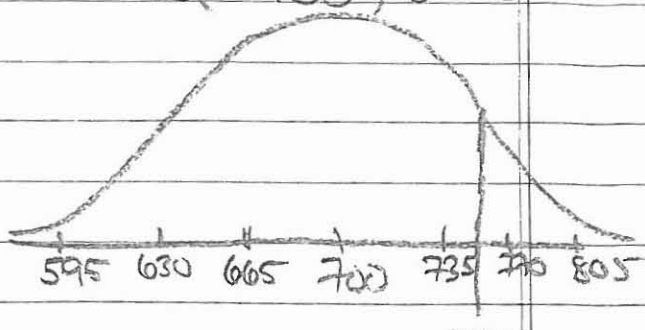


$$z_{750} = \frac{750 - 675}{50}$$

$$z = 1.5$$

Soft White bulb

$\mu = 700, \sigma = 35$



$$z_{750} = \frac{750 - 700}{35}$$

$$z = 1.43$$

The Standard light bulb was better, it is further from the mean, as can be seen from the higher z-score.

② mean (indicates center) & Standard deviation (shape)

③ NO. You can only use a normal model if the data is symmetric. It needs to meet the NEARLY NORMAL CONDITION.

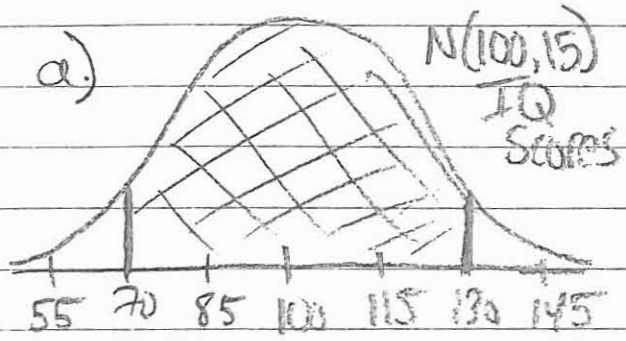
④ It means that we can take the real data in the histogram & apply it to a population by using a normal model. Now, we can start to describe the population.

(5) C. Z-score tells how many standard deviations we are from the mean.

(6) E.

(7) C. A normal model & all that is associated with it (Z-scores, 68-95-99.7 Rule) only tell us *approximations* about a *population*.

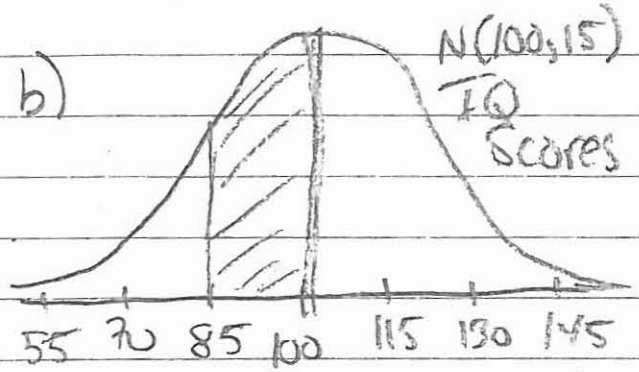
(8) a.



$z_{70} = -2$ $\quad z_{130} = 2$

P-value $= p(70 < y < 130)$
$= p(-2 < z < 2)$
$= 95\%$

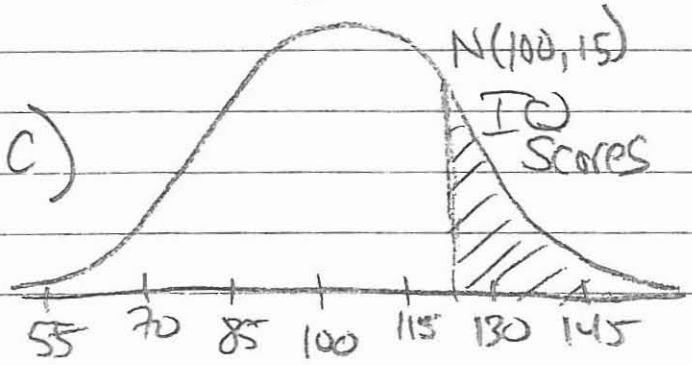
b)



$z_{85} = -1$ $\quad z_{100} = 0$

P-value $= p(85 < y < 100)$
$= p(-1 < z < 0)$
$= 34\%$

c)



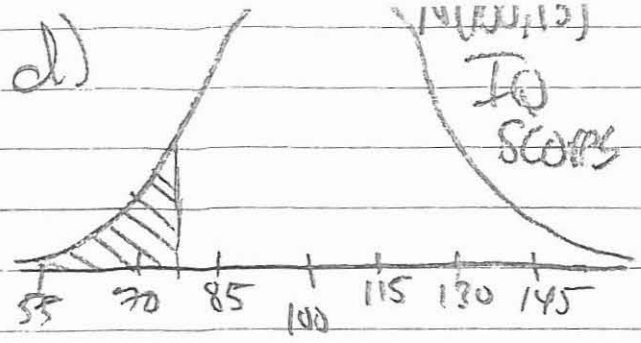
$z = \frac{y - \mu}{\sigma}$

$z = \frac{120 - 100}{15}$

$z = 1.33$

P-value $= p(y > 120)$
$= p(z > 1.3)$
$= 9.1\%$

d)



$Z = \frac{Y-\mu}{\sigma}$

$\frac{80-100}{15}$

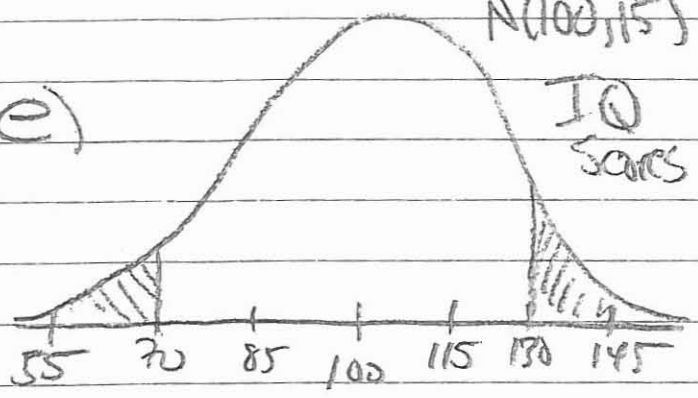
$= -1.33$

P-value = $p(Y < 80)$

$p(Z < -1.33)$

$= 9.1\%$

e)



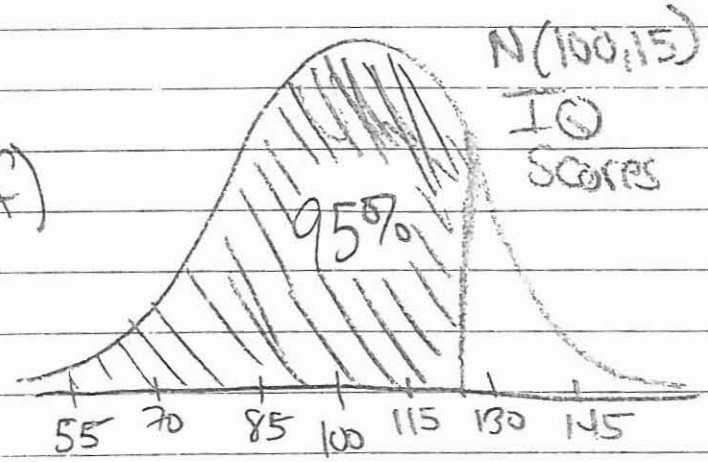
$z_{70} = -2$ $\quad z_{130} = 2$

P-value = $p(Y > 130$ or $Y < 70)$

$= p(Z > 2$ or $Z < -2)$

$= 5\%$

f)



$z_{95^{th} \text{ percentile}} = 1.645$

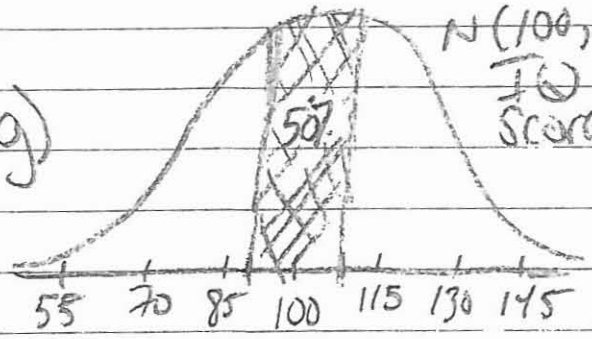
$Z = \frac{Y-\mu}{\sigma}$

$1.645 = \frac{Y-100}{15}$

$Y = 124.67$

95th percentile cutoff IQ is 125.

g)



$z_{25^{th} \text{ percentile}} = -.674$

$z = \frac{Y-\mu}{\sigma}$

$-.674 = \frac{Y-100}{15}$

$Y = 89.9$

$z_{75^{th} \text{ percentile}} = .674$

$z = \frac{Y-\mu}{\sigma}$

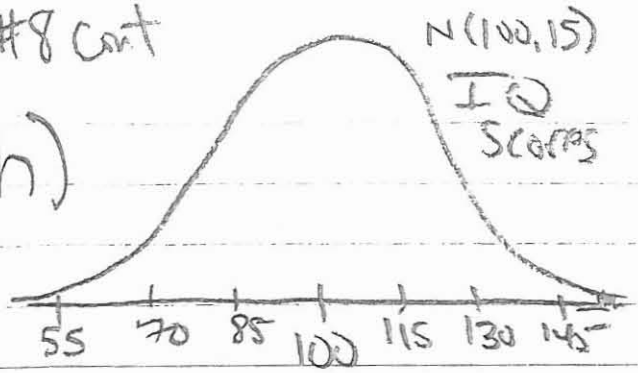
$.674 = \frac{Y-100}{15}$

$Y = 110.1$

The middle 50% of IQs fall between 90 and 110.

#8 Cont

h)



$$z = \frac{y-\mu}{\sigma}$$

$$z_{148} = \frac{148-100}{15}$$

$$z_{148} = 3.2$$

$$\text{P-Value} = p(y > 148) = p(z > 3.2) = .00069 \approx .07\%$$

Yes, this IQ is unusually high. There are only about .07% of population with an IQ this higher or higher

(g) This condition is used to see if the data is approximately symmetric. If it is approximately symmetric, then a Normal model can be used.

(h) The data DOES appear to approximate a normal curve.
The Normal Probability Plot is basically a straight line.